- a second module which, when executed, receives second data corresponding to at least one second point in the space, the second data for each one of the at least one second point including second information indicative of a likelihood of an association of the second data to at least a second part of the respective second point, and
- a third module which, when executed, associates the first and second points to the respective first and second parts based on the first and second information.--.

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REMARKS

I. GENERAL

Claims 1-14 have been amended merely to clarify the subject matter recited therein. It is respectfully asserted that no amendments to narrow the originally-filed claims have been made above for the above-referenced application. Indeed, claim 14 has been amended to also broaden the scope thereof. Attached hereto, please find a marked-up version of the claim change(s) made by the current amendment. The attached pages with the claim change(s) marked appropriately is captioned as **"VERSION WITH MARKINGS TO SHOW CLAIM CHANGES MADE"**. New claims 15-37 have been added to the above-identified application. Accordingly, claims 1-37 are now under consideration in the present application. Applicants respectfully submit that no new matter has been added.

II. <u>THE REJECTION UNDER 35 U.S.C. § 103(a) SHOULD BE WITHDRAWN</u>

Claims 1-14 stand rejected under 35 U.S.C. § 102(e) as being anticipated by U.S. Patent No. 5,201,035 issued to Stytz et al.. (the "Stytz Patent"), in view of U.S. Patent No. 6,373,484 issued to Orell et al. (the "Orell Patent"). It is respectfully asserted that independent claim 1, and claims 2-14 which depend from claim 1, are in no way taught or suggested by the alleged combination of the Stytz and Orell Patents for at least the reasons as set forth below.

In order for a claim to be rejected for obviousness under 35 U.S.C. § 103, not only must the prior art teach or suggest each element of the claim, the prior art must also suggest combining the elements in the manner contemplated by the claim. *See Northern Telecom, Inc. v. Datapoint Corp.*, 908 F.2d 931, 934 (Fed. Cir.), *cert. denied* 111 S.Ct. 296 (1990); *see In re Bond*, 910 F.2d 831, 834 (Fed. Cir. 1990).

One exemplary embodiment of Applicants' invention, as recited in independent claim 1, relates to a method of segmenting input data representing an image in order to locate a part of said image, with the input data comprising voxels. The method comprises the steps of, *inter alia*:

(a) storing a graph data structure in memory of a computer system, said graph data structure comprising nodes and edges having weights, ... **said nodes comprising at least one first node s, at least one second node t, and a plurality of voxel nodes** ...;

(b) **designating one of said voxel nodes as corresponding voxel node for each of said voxels**;

(c) **partitioning said nodes into at least two groups, one including said first node s and another one including said second node t, by a minimum-cut algorithm**; and

(d) **partitioning said voxels into at least two segments by assigning each of said voxels to the segment corresponding to the group to which said corresponding voxel node for the voxel belongs.**

The Stytz Patent relates to a dynamic algorithm selection to accomplish volume rendering along with isocontour and body extraction with a multiple-instruction, multiple-data microprocessor. (See Stytz Patent, column 1, lines 15-18). According to the description provided in the Stytz Patent, with this technique, the time required to anti-alias, extract isocontours, and render a volume of interest within a three-dimensional volume is reduced. (See *id.*, column 2, lines 52-56). The volume is first partitioned among the processors of a multiple-instruction, multiple-data (MIMD) microprocessor computer. As the user indicates the isocontour to be extracted and a cutting plane location within the image space volume, each microprocessor independently selects the optimum algorithm for rendering a portion of the volume represented by its local data set. (See *id.*, column 2, lines 56-63). Each microprocessor independently selects the optimum algorithm for rendering the volume of a suite of algorithms, based on desired cutting plane location and isocontour to be displayed. (See *id.*, column 2, line 64 to column 3, line 2).

The Stytz Patent describes the use of recursive volume rendering (hidden-surface removal – HSR) algorithms and adapted recursive BTF (back-to-front) and FTB (front-to-back) volume rendering algorithms. (See *id.*, column 4, lines 50-58). The

selection of an algorithm cutover point is described in the Stytz Patent with reference to Fig. 6 thereof. In particular, the basis for selecting either the adaptive FTB or BTF algorithm is the z'-dimension location of the cutting plane in image space. For the cutting planes close to the front of the scene, the adaptive BTF algorithm must process most of the data, whereas the adaptive FTB algorithm processes relatively little, giving the FTB algorithm the performance edge. As the cutting plane moves deeper into the scene, the two algorithms approach the same performance until, at the cutover point, the overhead of the adaptive FTB algorithm equals the pixel overwriting cost of the adaptive BTF algorithm. From the cutover point to the back of the scene, the adaptive BTF algorithm is faster than the adaptive FTB algorithm. (See *id.*, column 13, lines 23-37; and Fig. 6).

The Orell Patent relates to tools for the graphic representation of data structures and to an application thereof for testing software performance. (See *id.*, column 1, lines 5-7). In particular, the data representative of at least two edges branching between a pair of nodes is provided so as to allow the edges to be separately identifiable. Different display attributes are assigned to the edges so that the edges can be visually distinguished. Then, the data structure can be graphically displayed in 3-D. (See *id.*, column 3, lines 53-60). Such method is applicable to graphically displaying execution paths of computer program components having multiple execution paths, which are represented by edges. In particular, prior to the assignment of the display attributes, a computer program component is processed so as to derive a data structure

containing the nodes being representative of all basic blocks thereof. The edges represent the lines connecting the nodes, and the execution paths are traversed during operation of the computer program components. (See *id.*, column 4, line 61 to column 5, line 4).

Applicants respectfully assert that the Stytz Patent, taken alone or in combination with the Orell Patent, does not teach or suggest, much less disclose an method of segmenting input data (which includes voxel) representing an image in order to locate a part of the image, in which, *inter alia*, **the voxels are partitioned into at least two segments by assigning each of the voxels to the segment corresponding to the group to which a corresponding voxel node for the voxel belongs**, as explicitly recited in independent claim 1 of the above-identified application. It appears that by relying on the disclosure of the Stytz Patent, the Examiner is equating the use of a cutting plane for a scene described in the Stytz Patent to the partitioning of the voxels as recited in Applicants' independent claim 1. However, as shall be discussed in further detail below, the use of the "cutting plane" of the Stytz Patent does not segment the voxels into two segments as recited in independent claim 1.

In particular, it is respectfully asserted that even if the use of the partitioning plane of the Stytz Patent can be equated to the partitioning of the voxels of Applicants' claimed invention, the Stytz Patent in no way partitions the voxels into at least two segments by assigning each of the voxels to the segment corresponding to the group to which a corresponding voxel node for the voxel belongs. As described

above, the basis for selecting either the adaptive FTB or BTF algorithm is the z'-dimension location of the cutting plane in image space. (See Stytz Patent, column 13, lines 23-25). However, there is absolutely no teaching or suggestion in the Stytz Patent that the voxels are partitioned in the manner recited in independent claim 1, much less that such partitioning is done by assigning each such voxel to the particular segment.

In addition, Applicants respectfully assert that the Stytz Patent does not teach or suggest that the **nodes are partitioned into at least two groups by <u>a minimum-cut algorithm</u>**, as also recited in independent claim 1. For example, the minimum "cut" as recited in Applicants' claims can separate the nodes according to a defined optimization criterion on the data associated with the voxels. Th Stytz Patent only describes the use of recursive volume rendering HSR algorithms and adapted recursive BTF and FTB volume rendering algorithms (see Stytz Patent, column 4, lines 50-58), but does not even mention, much less teach or suggest the use of the <u>minimum-cut algorithm</u>, as explicitly recited in independent claim 1.

The Orell Patent does not cure at least these deficiencies of the Stytz Patent, nor does the Examiner contends that it does. Further, at least because claims 2-14 depend, either directly or indirectly, from independent claim 1, Applicants respectfully assert that claims 2-14 are also not taught or suggested by the alleged combination of the Stytz Patent and the Orell Patent.

Further with respect to claim 8, this claim recites the assignment of weights to first and second edges which are associated with likelihood numbers for the

voxels. In the Office Action, the Examiner believes that this recitation is disclosed in the Orell Patent on column 5, lines 43-45. However, this section of the Orell Patent only describes that the presentation of values via colors is accompanied by the ability to view specific information about nodes and edges. Thus, neither this section nor any other section of the Orell Patent provides any teaching or suggestion of **the setting of weights to the edges especially which are associated with the likelihood numbers**, as recited in claim 8.

Therefore, an affirmation of patentability is respectfully requested for pending claims 1-14.

III. NEW CLAIMS 15-37

New claims 15-37 are presented to cover further aspects of Applicants' invention. Support for new claims 15-37 can be found throughout the specification and in the drawings. New independent claims 34 and 36 recite system and software storage medium, respectively, which include the recitations of independent claim 1. Accordingly, it is respectfully asserted that these new independent claims 34 and 36 are also not taught or suggested by the alleged combination of the Stytz and Orell Patents for at least the same reasons as presented above with reference to independent claim 1. In addition, new claims 15-33, 35 and 37 are provided herein above which recite additional subject matter which Applicants' regard as their invention.

IV. CONCLUSION

In light of the foregoing, Applicants respectfully submit that pending claims 1-37 are in condition for allowance. Prompt reconsideration and allowance of the present application are therefore earnestly solicited.

Respectfully submitted,

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VERSION WITH MARKINGS TO SHOW CLAIM CHANGES MADE

1. (Amended) A method of segmenting input data representing an image in order to locate a part of said image, said input data comprising voxels, said method comprising the steps of:

    (a) storing a graph data structure in [the] memory of a computer system, said graph data structure comprising nodes and edges [with] having weights,

        (i) said nodes comprising at least one first node[s] s, at least one second node t, and a plurality of voxel nodes, and

        (ii) said edges comprising

            (A) at least one first edge [from] connecting said first node s to at least one of said voxel nodes,

            (B) at least one second edge [from] connecting at least one of said voxel nodes to said second node t, and

            (C) at least one neighbor edge [from] connecting at least one of said voxel nodes to another one of said voxel nodes;

    (b) designating one of said voxel nodes as corresponding voxel node for each of said voxels;

    (c) [setting said weights for said edges;

(d)] partitioning said nodes into at least two groups, one including said first node s and another one including said second node t, by a minimum-cut algorithm; and

([e]d) partitioning said voxels into at least two segments by assigning each of said voxels to the segment corresponding to the group to which said corresponding voxel node for the voxel belongs.

2. (Amended) The [A] method of claim 1 wherein:

[(a)] said input data further comprises a neighborhood structure, and

[(b)] at least one of said neighbor edges is between two of said voxel nodes designated as said corresponding voxel nodes for said two of said voxels that are neighbors to one another according to said neighborhood structure.

3. (Amended) The [A] method of claim 2, wherein said voxels comprise at least one of [the whole or a part of a] a portion of or an entire DIM-dimensional array of data.

4. (Amended) The [A] method of claim 3, wherein said neighborhood structure comprises [the] a k-th nearest neighborhood structure.

5. (Amended) The [A] method of claim 3, wherein at least one part of said array of data represents one or more physical properties of said voxels at regular grid positions within [the] an interior of solid bodies.

6. (Amended) The [A] method of claim 4, wherein at least one part of said array of data represents one or more physical properties of said voxels at regular grid positions within [the] an interior of solid bodies.

7. (Amended) The [A] method of claim 3, wherein a size of the DIM is at least 3.

8. (Amended) The [A] method of claim 1, [(a)] wherein said input data further comprises a likelihood number for each of said voxels[; and], and further comprising the step of:

([b]e) [step of] setting [said] weights for said first, second and neighbor edges [comprises a step of,] for each voxel node[,] by setting:

(i) [said] a weight for said first edge [from] connecting said first node s [to] with said voxel node to a first nonnegative number $w1$, and

(ii) [said] a weight for said second edge [from] connecting said voxel node [to] with said second node t to a second nonnegative number $w2$ so that [(iii) w1 – w2] the first non-negative number minus the second non-negative number equals the sum of

likelihood numbers for all of said voxels to which said voxel node is designated as said corresponding voxel node.

9. (Amended) The [A] method of claim 8, wherein:

[(a)] said input data further comprises a neighborhood structure, and

[(b)] at least one of said neighbor edges is between two of said voxel nodes designated as said corresponding voxel nodes for two of said voxels that are neighbors according to said neighborhood structure.

10. (Amended) The [A] method of claim 9, wherein said voxels comprise at least one of [the whole or a part of a] a portion of or an entire a DIM-dimensional array of data.

11. (Amended) The [A] method of claim 10, wherein said neighborhood structure comprises [the] a k-th nearest neighborhood structure.

12. (Amended) The [A] method of claim 10, wherein at least one part of said array of data represents one or more physical properties at regular grid positions within [the] an interior of solid bodies.

13. (Amended) The [A] method of claim 11, wherein at least one part of said array of data represents one or more physical properties at regular grid positions within [the] an interior of solid bodies.

14. (Amended) The [A] method of claim 10, wherein a size of the DIM is at least three.